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THESIS

AN IMPLEMENTATION OF INTEGRATED LOGISTIC
SUPPORT FOR TURKISH ARMED FORCES

by

Sezai Erzin

June, 1990

Thesis Advisor

LTC Bard Mansager

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AN IMPLEMENTATION OF INTEGRATED LOGISTIC SUPPORT FOR
TURKISH ARMED FORCES

by

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Submitted in partial fulfillment
of the requirements for the degree of

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ABSTRACT

Inadequate logistics support planning marred the major weapon systems acquisitions of the Turkish Army. Budgetary restraint emphasized the purchase of least-cost weapon systems and reduced operational and sustained readiness to secondary roles. Moreover, inadequate planning required the Turkish Army to inefficiently use additional resources to operate and maintain these systems. This thesis provides guidance allowing the Turkish Army to use a life-cycle support management plan for future weapon systems acquisitions.

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I. INTRODUCTION

A. GENERAL

Obtaining effective support of a weapon system during its operating cycle has long been a topic of heated debate between operator and logistician. In particular, logistic support of weapon systems in the Turkish Army has been problematic in the past. The need exists to improve the present concepts and methodologies used by the Turkish Army for the logistical supportability of major weapon systems. Unfortunately the Turkish Army is supported by an anemic national economy. Financial constraints plague all facets of national growth. The Turkish Army has to be cautious in spending the available budget and must adopt cost cutting approaches in the pursuit of operational readiness objectives without making undue compromises in new weapon systems acquisitions. However, it is a fact of life that a significant portion of the defense budget goes to support systems and equipment that are presently in operation.

The support requirements for spare parts, maintenance, training, facilities, and the like are determined to a large measure by the design of the equipment. Attention to designing with the objectives of driving support costs down can result in significant long range reduction in the life cycle cost of the system. These early costs associated with deliberately designing for support in the future are offset in subsequent years by reduced system/equipment operation and maintenance costs.

B. IMPORTANCE OF LOGISTIC SUPPORT

Rapid advancement during the last two decades in weapon technology has led to increasingly complex sophisticated hardware systems. With the advance in technology, logistic requirements have increased in general. In addition, maintenance support requirements have also become more complex. It is no longer possible to meet maintenance and support goals for current state-of-the-art hardware.

During the last decade costs associated with system/product acquisition and logistic support have increased at an alarming rate. At the same time, decreasing government budgets combined with inflationary trends have resulted in less money available for procurement of new systems and for the maintenance and support of those items already in use. This requirement to increase overall productivity in a resource constrained environment has forced the attention of managers to all aspects of system life cycle. Total system cost must be given more attention, particularly those costs associated with system operation and support, since these costs constitute a large portion of the life cycle cost. The severity of the lack of cost visibility can be related to the "iceberg effect" as illustrated in Figure 1.1 [Ref.1].

Logistic support is a significant contributor to life cycle cost. Further, the decisions made during early stages of system planning and conceptual design have a serious impact on the projected life cycle cost for a given system. It is therefore essential that logistic support be considered, as part of the decision making process, in the early phases of weapon system planning and design [Ref. 1: p. 11].

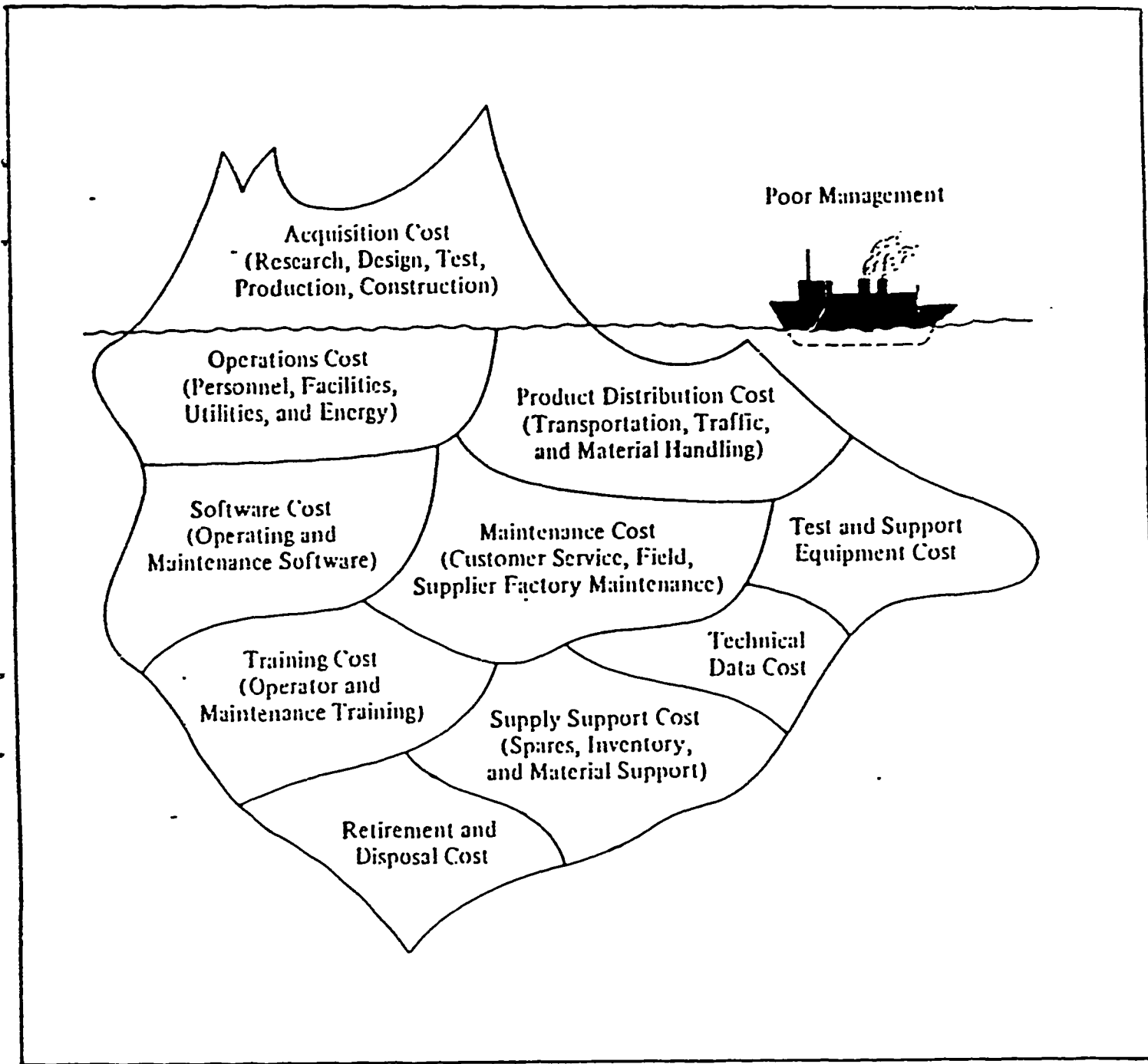


Figure 1.1 Total Cost Visibility [Ref. 1: p. 66]

The fact that maintenance and support technology had not kept pace with the advancement of hardware development, had long been accepted by the U.S. military. Recognizing the increasing need for more effective maintenance support techniques, the United States Department of Defense, in 1964, directed that the basic elements of integrated logistic support (ILS) be included in planning for the acquisition of defense systems and major items of equipment [Ref.2: p. 56]. A more recent definition of ILS is given below.

A disciplined, unified, and iterative approach to the management and technical activities necessary to: (a) integrate support considerations into system and equipment design; (b) develop support requirements that are related consistently to readiness objectives, to design, and to each other; (c) acquire the required support; and (d) provide the required support during the operational phase at minimum cost [Ref.3: p. 38].

The logistics system concept and the technology of logistics have made remarkable progress and also gained substantial attention among business executives during the last two decades. Also, the systems approach to logistics has been recognized within industry and throughout the business world. Logistics is now considered to be a productive functional area that can be managed to increase the profitability of a company [Ref. 1: p. 13].

Traditionally, in their effort to reduce cost and improve profits, businessmen concentrated their efforts on manufacturing. Production techniques have been constantly improved, but the efforts to reduce production costs in many companies have reached a point where relatively little more can be gained. Consequently, business managers now turn their attention to non-manufacturing operations which include functions such as

procurement, transportation, warehousing, inventory control and material handling, all of which are considered integral parts of logistics.

Needless to say, in non-profit oriented organizations, especially the Turkish Army, the logistics function has become a major part of activity, both in terms of scale and importance. A well organized and properly managed logistic system is essential for the Turkish Army in order to carry out its missions in peacetime as well as wartime.

Considerable time and effort have been devoted to the development of credible military strategic and tactical doctrines to define Turkish National Defense. Various strategies are continually under review to find better methods of projecting military power. Unfortunately, in this process, logistics has long been relegated to a category of secondary importance. In many cases, the crucial logistics problems are considered troublesome tasks, and then these logistic problems are much less interested, investigated and resolved by logisticians in Turkey.

Moreover, the systems approach to looking at logistics involves designing it and managing it as a whole function rather than as a series of discrete, independent ones. If their independence and interrelations are not recognized, sub-optimization will often occur with a resulting reduced efficiency and increased costs for the organization.

One way to avoid the above situation and to improve the way of thinking about logistics support and organizational performance would be to integrate the elements of the organization and to inform and educate members of the organization about existing theories and ideas within the field. A review of historical and current logistical realities,

and their impacts on readiness will reinforce the critical necessity to examine logistical implications.

C. PURPOSE AND SCOPE

This thesis research is based on published definitions and explanations of the concept of military logistics. The principal objective of this thesis research is to analyze and evaluate the Turkish Army logistics support problem with emphasis on the integrated logistics support (ILS) and life-cycle cost (LCC) concept.

Chapter II deals with the strategic location and value of Turkey and relationships between U.S. and Turkey. It then explains the current state of the Turkish Armed Forces. It defines the Turkish logistics problem and alternative solutions.

Chapter III is concerned with establishing the concept of modern military logistics and indicating the appropriate directions for Turkish Military improvement of logistic support. The U.S. ILS methods are also examined as a guide for implementation. The life cycle cost concept is also explored for better understanding of ILS.

Chapter IV describes the ILS concept, discusses the ILS elements, and describes logistics in the system life-cycle and cost-effectiveness analysis during acquisition process, as they apply to Turkey. It also defines management responsibility in integrated logistics support planning.

Chapter V illustrates the application and implementation of ILS and ILS planning to find solutions for the problems mentioned in Chapter I and Chapter II.

Chapter VI consists of conclusions and recommendations.

II. BACKGROUND OF THE PROBLEM

A. THREAT

1. Strategic location and value of Turkey

a. Strategic Considerations

Turkey occupies one of the most strategically important locations in the world. Turkey is a gateway between West and East. At the intersection of three continents, Europe, Asia and Africa, Turkey has borders on three different seas. The Turkish Straits connect the Black Sea with the Aegean and the Mediterranean. The European part of Turkey lies in the Balkans, whereas Anatolia, the Turkish heartland, is adjacent to oil fields in the Middle East and the Persian Gulf. Turkey is located directly between Europe and Asia, and borders on six nations. Nearly one half of its 2620 km (1628 miles) of land frontier is with European states: Greece, Bulgaria and the U.S.S.R.. The remainder is with Iran, Iraq and Syria [Ref.4: p. 65].

Turkey maintains the second largest armed force in North Atlantic Treaty Organization (NATO), with over 800,000 personnel. This constitutes thirty-seven percent of the standing manpower forces in Europe available to NATO. Turkey defends twenty-seven percent of the land area of NATO Europe and thirty-seven percent of the NATO-WARSAW Pact land frontier.

Turkey, facing the longest border with the WARSAW Pact of any alliance member plays an exceptional role as the anchor of NATO's southeastern front in Europe.

Turkey secures the Turkish Straits and deters any attempted Soviet movement into Southwest Asia through the Transcaucasus Region. In the Middle East, Turkey also plays a critical role in defending vital sea and land communication lanes which cross the region, as well as providing a potential barrier to Soviet adventurism in the Middle East region's enormous oil reserves [Ref. 5: p. 84].

b. Defense policy

Turkey's defense policy is predicated on deterrence. Its outstanding force in NATO is second only to the U.S. Turks recognize that their ability to resist intimidation must be grounded in internal resources. In the early stages of a war, they would have to fight alone and could not count on early reinforcements [Ref.6: p. 44]. Counting the Soviet divisions on their eastern border and the Bulgarians on the west, Turks today face a total of forty-five WARSAW Pact divisions. Turkey is likely to be the first target in the event of a NATO/WARSAW Pact war [Ref.7: p. 30]. The capability of peacetime deterrence and mobilization missions depend heavily on the existence of modern weapon systems and military equipment. Without these modern systems and equipment, no armed force can succeed.

c. Relations with Russia

Relations between Russia and Turkey have been hostile and frequently violent. Over the course of centuries these two nations have fought each other thirteen times [Ref. 5: p. 46]. The Treaty of Friendship, signed by the Soviet Union and Turkey on March 16, 1921, was the first major international treaty between the two powers. The

Friendship Treaty was renewed in 1925. However shortly after World War II, the Soviets attempted to take control of the Bosphorus (Turkish Straits). President Truman's response was to send the battleship USS Missouri to Turkey. This U.S. action caused Russia to stop their adventurism.

Following these events, U.S. military aid to Turkey began in 1948. Because of Turkey's geo-strategic position there was a very urgent need to have modern military equipment. Since then U.S. military assistance played an essential role in preserving Turkey's independence [Ref. 8: p. 2].

B. CURRENT STATE OF THE TURKISH ARMED FORCES

Turkey has received most of its weapons and other military equipment through U.S. and German Security Assistance.

The military relationship between the U.S. and Turkey began in 1948. This has been a continuous relationship with the exception of the U.S. arms embargo against Turkey in the mid-1970s. Turkey's current spare parts and weapon problems are caused primarily by:

- Old equipment;
- Inflation in weapon costs;
- Obtaining used equipment from U.S. by means of military aid;
- The purchase of more expensive military equipment from foreign countries other than U.S. during the U.S. embargo, and
- Turkey's domestic economic problems [Ref. 9: pp. 15, 16].

Most of Turkey's military equipment was purchased in the 1960s. As a result, Turkish weapons are approximately ten years older than those of most other NATO nations.

Rapid improvements in Soviet block weapon systems requires Turkey to try to keep pace in order to maintain a deterrent effect against the Soviet Union. Realizing this, Turkey spends millions of dollars annually on military equipment in addition to military aid obtained from U.S. and Germany. Most of the weapon systems are purchased from foreign countries. This in turn causes problems in the effective use of these weapon systems because of the variety among them.

C. PROBLEMS AND ALTERNATIVE SOLUTIONS

Turkey's basic strategy is to improve its self-reliance while closely coordinating with the United States. The hope is to gain a balanced defense posture as soon as possible. It is believed that a military balance will guarantee peace on the Turkish peninsula.

There are significant problems such as:

- The large military imbalance with Soviet Union;
- Uncertainty of the U.S. defense policy and
- Logistics.

Little can be done for the first two. The solution lies with logistics.

The military environment worldwide has experienced rapid change. Since World War II, the importance of logistics has been stressed at all level of military activities.

Considering the importance of logistics, Fred Gluck stated that:

The importance of strategies and tactics notwithstanding, modern military logistics is the basis of military power (the level and duration of war that can be waged by combat forces). Therefore, the effective and efficient operation of modern military logistics is critical to the safety and survival of an army during war. Modern military logistics must provide the assurance that concept, structure, focus and management of military logistics are present and effectively aligned to provide for the need of today's military forces in general and its combat forces in particular [Ref. 10: p. 28].

Military logistics is critical to the defense of Turkey. If we fail to understand modern military logistics, many problems will occur. The author will try to relate these problems to his personal experience.

In 1986, I was assigned by the Turkish Army to receive four M110 eight-inch self propelled howitzers. These howitzers were purchased from the U.S. to replace Honest John rockets. Before leaving my base to receive the weapons, I participated in a 10 day training course on the M107/175mm cannon in one of the existing M107/175mm batteries. The instructor was the commander of this battery. Not having the howitzers at that time, we had to practice on M107/175 cannon because the hull and the engine of this weapon was similar to that of the M110. Although the idea was to train me, the maintenance personnel, the howitzer drivers and other officers like myself, it was obvious that ten days was an insufficient training period.

After completion of this course I went to Istanbul to receive the guns. The weapons were not new and were shipped to Turkey with many uncorrected maintenance problems. While an American maintenance team was trying to correct these problems, I examined the weapons as much as possible, trying to learn about this new system.

We took the four weapons back to our base. The only manual we found for the weapons was the driver's manual, which, unfortunately was written in English. We did not even know what kind of fuel was needed to operate the howitzer. Fortunately, the tanks were full so I took a sample from the tank of one of the howitzers and sent it to be analyzed. Similar problems occurred frequently.

Another issue concerned testing of the ammunition. The howitzer had a new type of ammunition called improved conventional munitions (ICM), which had never been fired in Turkey. The purpose was to test the impact of the ammunition. I was ordered to perform the firing test. This was not the right procedure. I was not comfortable during the firing test because I wasn't provided with the necessary testing equipment and technical assistance. Testing of a new purchased equipment should be done by authorized personnel before the system is brought to the field.

I also faced many maintenance problems as the time passed. First, the tracks on the howitzers deteriorated. Unfortunately, there were no spare parts to replace them. Next the manual elevation system did not work properly so I called maintenance personnel to repair it. They tried to repair it, but they had no experience and training on this system and had significant difficulties. What initially took several weeks to repair took only 10 minutes to do after the maintenance crews became familiar with the system. This wasted time could have been used much more efficiently.

The reasons for these problems are listed below:

- Lack of sufficient funds designated specifically for related parts, repair training, and initial purchase of equipment;

- Failure to maintain effective and efficient military logistics operation, specifically, pre-allocation and post-purchase supervision;
- Unclear military logistics doctrine, lacking specific goals;
- Establishment of a proper measurement of productivity and effectiveness at logistics support of military equipment.

To solve these logistics problems, Turkey must first fully understand military logistics and establish a concept of modern military logistics which provides a direction for military logistics. Secondly, Turkey must establish an integrated logistics support system to support the Turkish Army in an effective and efficient manner. Thirdly, Turkey must establish a rational acquisition process in terms of the life-cycle cost concept.

III. THE ESTABLISHMENT OF A MODERN MILITARY LOGISTIC CONCEPT

To establish the modern military logistics concept for the Turkish Army, it is necessary to study the U.S. ILS Policy for three major reasons; first the armies of the two countries are very similar. Secondly, U.S. supplies Turkey not only with most of its major weapon systems, but with the necessary training as well. Thirdly, the U.S. has demonstrated ILS's usefulness.

A. BACKGROUND OF ILS POLICY & GUIDANCE

The U.S. Department of Defense issued the first DoD Directive on ILS, designated as DoD 4100.35, Development of ILS for Systems and Equipment, in 1964. It was a major milestone in the evolution of DoD systems management because it formally set forth logistics support as a design consideration that needed to be managed from the conception of a program. DoD also published a ILS Planning Guide [Ref. 11], to help Program Managers establish logistics support objectives in their plans for fielding a new system. The guide provided a road map of typical logistics actions to be accomplished during the life of a system of equipment. The individual military services then issued local directives to ensure and streamline implementation of integrated logistics support in their peculiar styles and setting.

The original directive on ILS has been revised and reissued a number of times. Other specifications and directive documents have also been developed to enhance the concept of logistics support as a part of system or equipment design. Organizational changes have

also been affected to bring the logistician closer to the design process for a new system, hopefully to impact on design decisions that affect supportability. However, the primary objective of the ILS program remains the same; that is, achieving a system readiness objective within an affordable life-cycle cost.

B. LIFE CYCLE PHASES

Implementation of the ILS concept necessitates weaving the threads of the principal ILS elements into the fabric that is acquisition and support life cycle. There are four distinct phases in the acquisition of a new system. Normally these are concept exploration, demonstration and validation, full-scale development, and production and deployment [Ref. 12: p. 135]. These phases are separated by decision milestones as shown in Figure 3.1 which is a reproduction from Ref.8. The planning of the logistics support program is to be formalized at the beginning of full-scale development phase with appropriate performance milestones delineated throughout development, production and deployment.

1. Concept Exploration

This is the first phase in the acquisition life-cycle. During this phase the technical, military and economic needs for an acquisition program are established through comprehensive system studies and experimental hardware development and evaluation. It is highly iterative phase, with stages overlapping rather than occurring sequentially. Generally, the following stages occur in this phase:

- Identification and definition of conceptual systems;

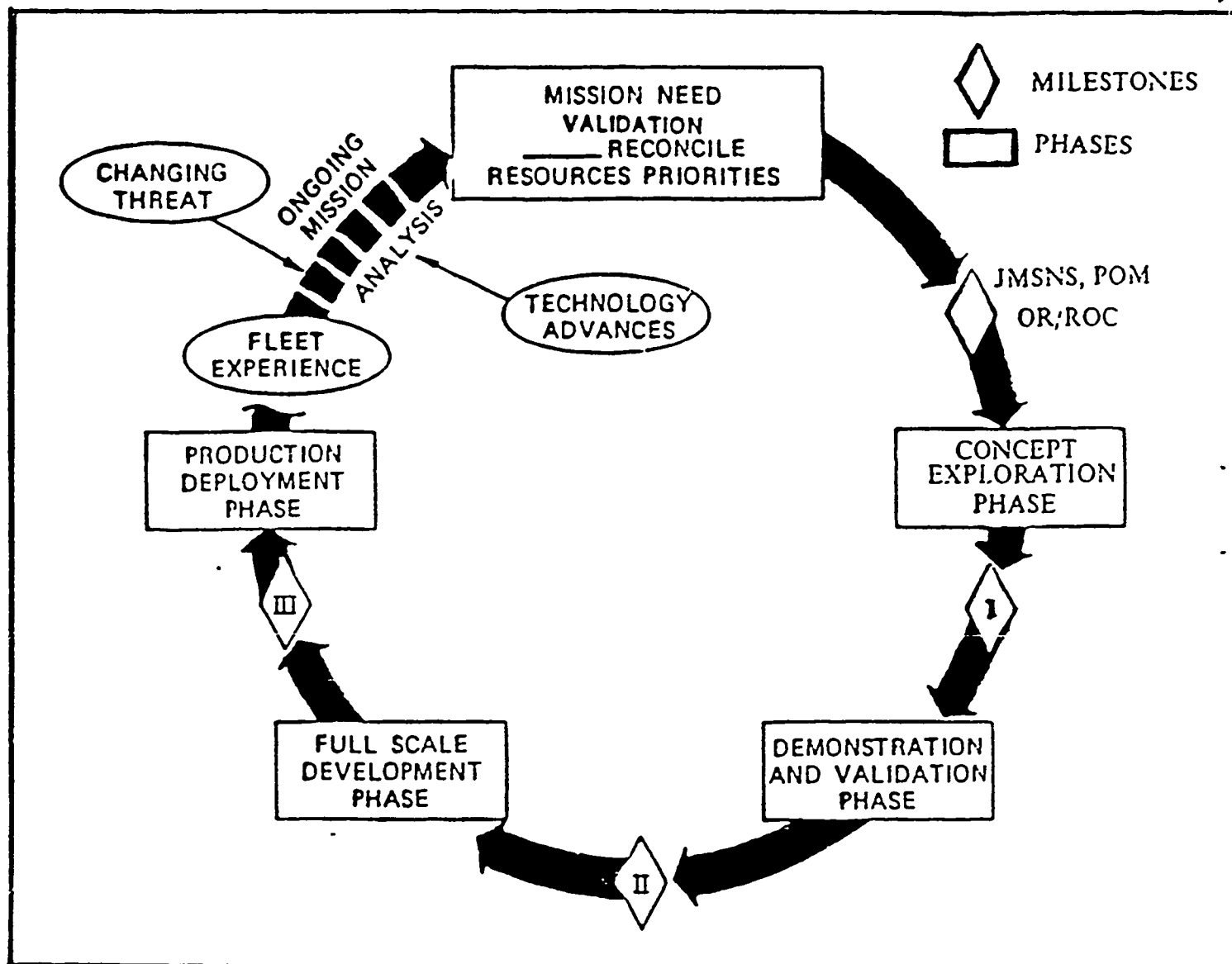


Figure 3.1 Acquisition Phases [Ref. 8: p. 128]

- Analysis of threat, mission, feasibility, risk and costs involved in development;
- Evaluation of alternative concepts on the basis of estimated life-cycle cost, development schedule and performance;
- Recommendation of one or more concepts for further development.

At this point we need to define some pertinent terms from the acquisition process:

a. Life-Cycle Cost (LCC)

LCC involves all costs associated with the system life-cycle include following [Ref. 1: p. 5]:

- Research and development (R&D) cost - the cost of feasibility studies; system analyses; detail design and development, fabrication, assembly, and test of engineering models; initial system test and evaluation; and associated documentation.
- Production and construction cost - the cost of fabrication, assembly, and test of operational systems (production models); operation and maintenance of the production capability; and associated initial logistics support requirements (e.g., test and support equipment development, spare/repair parts provisioning, technical data development, training, entry of items into inventory, facility construction, etc.).
- Operation and maintenance cost - the cost of sustaining operations, personnel and maintenance support, spare/repair parts and inventory, test and support equipment maintenance, transportation and handling, facilities, modifications and technical data changes, and so on.
- System retirement and phaseout cost - the cost of phasing the system out of the inventory due to obsolescence or wearout, and subsequent equipment item recycling and reclamation as appropriate.

Figure 3.2 illustrates a typical life-cycle cost profile of a weapon system.

Figure 3.3 represents system cost profile showing yearly separate cost factors. Figure 3.4 illustrates individual cost factors. (All three Figures are reproduced from Ref.1).

LIFE COST PROFILE

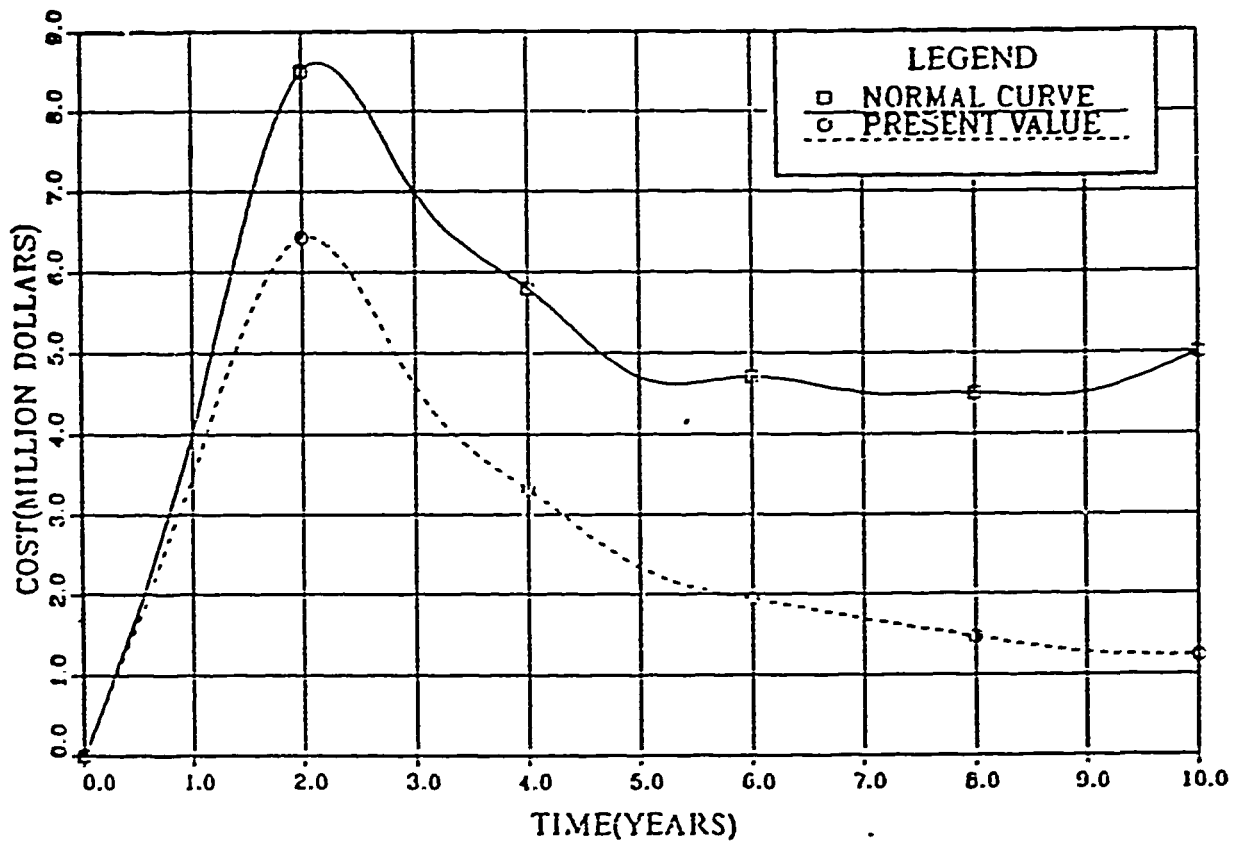


Figure 3.2 A Typical System Life Cycle Profile [Ref. 1: p. 398]

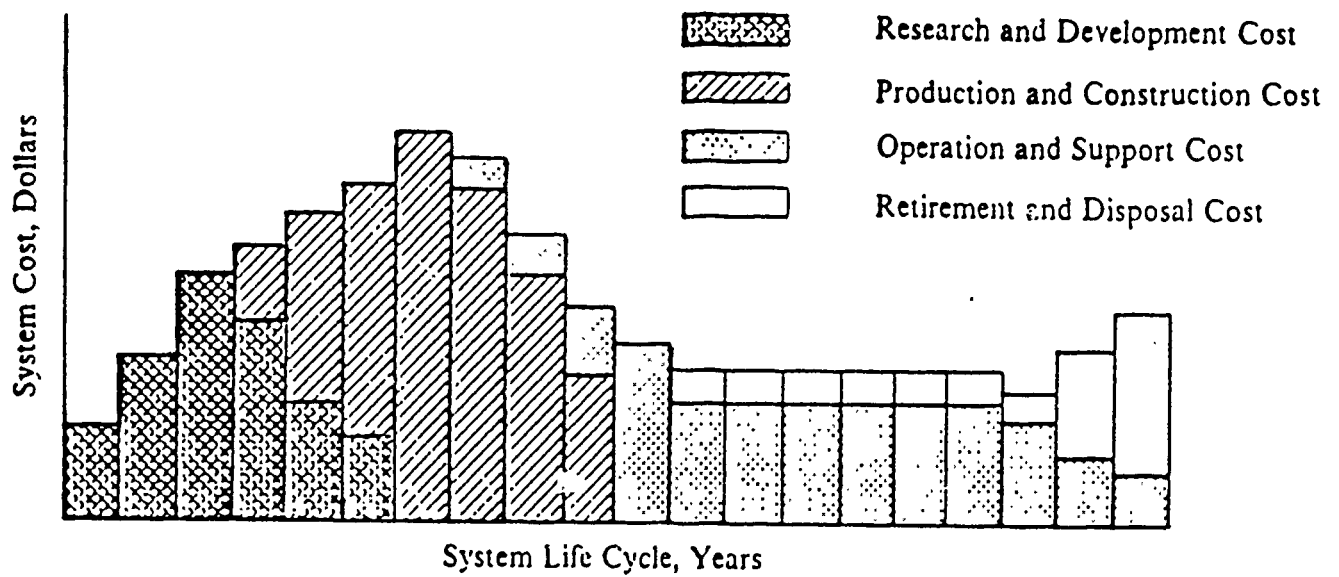


Figure 3.3 System Cost Profile [Ref. 1: p. 72]

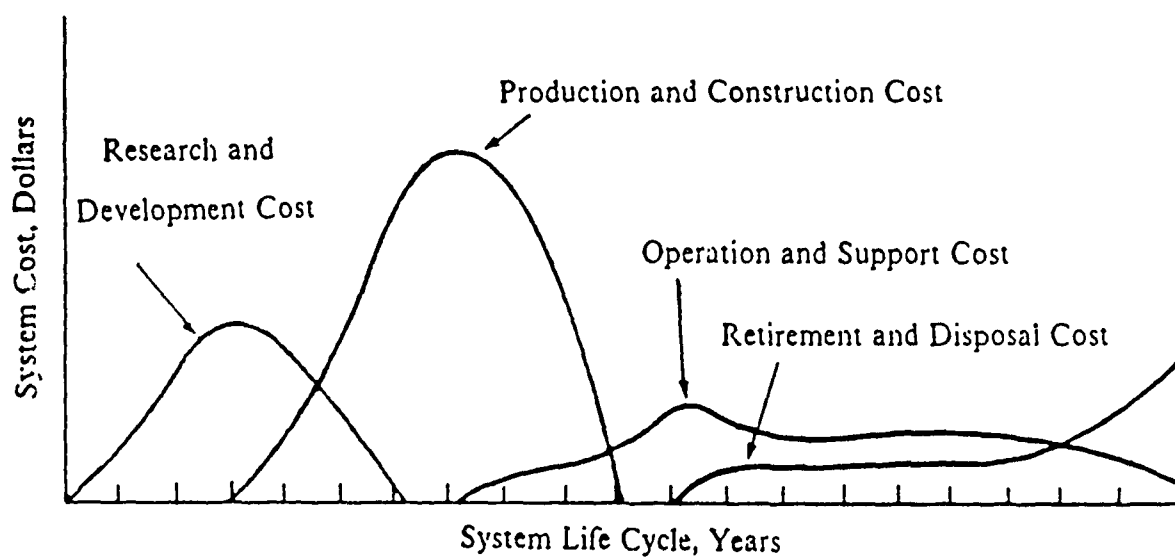


Figure 3.4 Individual Cost Factors in a System [Ref. 1: p. 72]

Life-Cycle Cost must be considered on an equal footing with performance, time and logistics supportability goals. A major portion of the actual life-cycle costs for a given system stems from the consequences of decisions made during the early phases of program planning and conceptual design. Historically, decisions made during the concept exploration phase (especially which concept and what thresholds are selected) have fixed approximately 70% of the life cycle cost of the system. Roughly 85% of the LCC has been frozen before the full-scale development phase begins, when only a small percentage of total system cost has been expended. This fact is graphically illustrated in Figure 3.5. Thus, a life-cycle approach, if incorporated during concept exploration, can be more economical in the long run [Ref. 13: p. 6].

b. Systems Engineering

It is easy to put a system together but difficult to put the best system together. System engineering is the discipline that ties together all aspects of a program to assure that the individual parts, assemblies, subsystems, support equipment and associated operational equipment will effectively function as intended in the operational environment [Ref. 1: p. 9].

c. Maintenance Concept

The maintenance concept defines what will be repaired and what maintenance levels (i.e., organizational, intermediate, and depot), the major functions to be accomplished at each level of maintenance, basic support policies and primary logistics support requirements. A support policy specifies the anticipated extend to repair of an

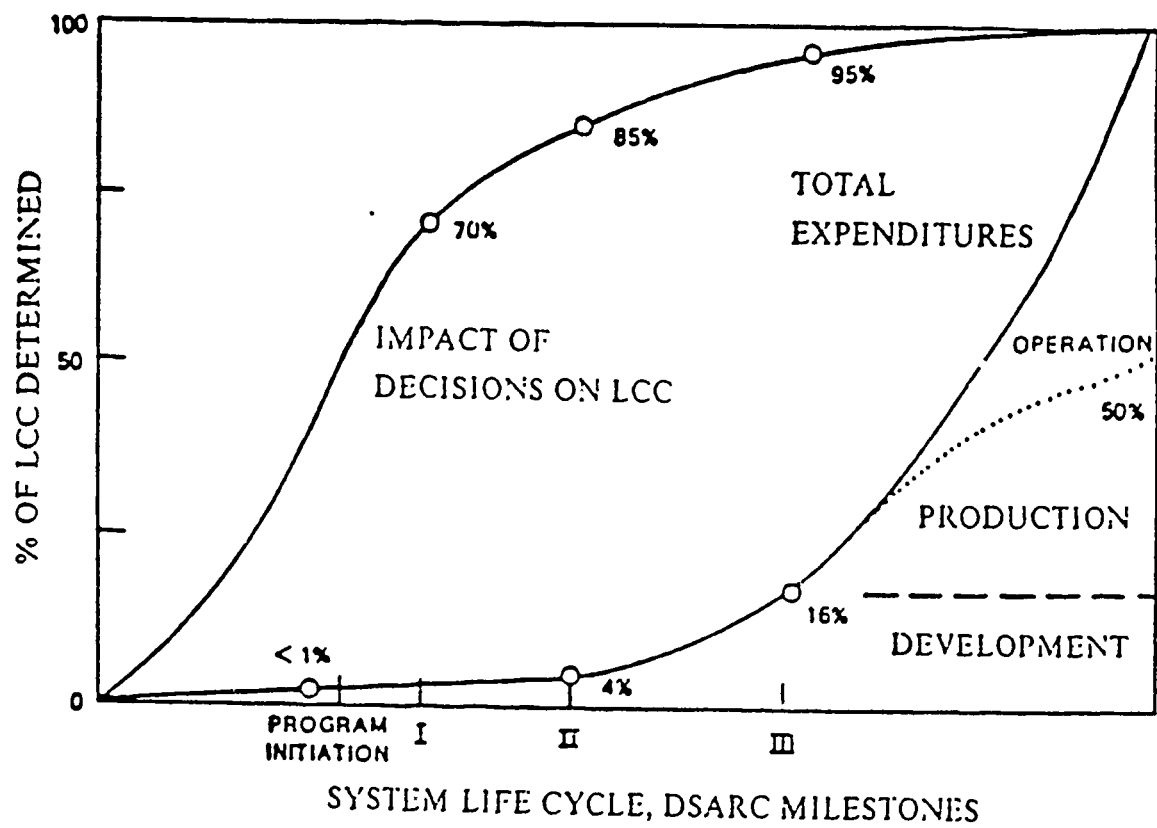


Figure 3.5 Typical Weapons Life Cycle Cost [Ref. 8: p. 155]

equipment will be accomplished. It may dictate that an item should be designed to be nonrepairable, partially repairable, or fully repairable. It may also specify what test equipment and repair parts are needed. Logistics support requirements relates to the organizational responsibilities for maintenance in accordance with the support policy. For instance, if the support policy dictates that no external test and support equipment is allowed at the operational site, then the prime equipment design must incorporate some provision for built-in self test. The maintenance concept is defined at program inception and is a prerequisite to system design and development.

d. Reliability, Maintainability and Availability (RM&A)

Reliability is the probability that a system or product will perform in a satisfactory manner for a given period of time when used under specified operating conditions [Ref 1: p. 12].

Maintainability is defined as the ability of an item to be retained in or restored to a specific condition when maintenance is performed by personnel having specified skills levels, using prescribed procedures and resources, at each prescribed level of maintenance and repair [Ref 1: p. 15].

Operational Availability is the probability that a system or equipment, when used under stated conditions in an actual environment, will operate satisfactorily when called upon. Availability is a function of reliability, maintainability, and fleet support and is usually given as a design goal [Ref 1: p. 18].

2. Demonstration and Validation

The second phase in the acquisition of a new system is called Demonstration and Validation. During this phase, major program characteristics are validated and refined through extensive study and analysis, hardware development or prototype testing. Emphasis is given more to hardware development and paper studies in order to obtain a better definition of program characteristics and greater confidence in risk resolution and ultimate outcome. It includes commitments that contractors are willing to make major program characteristics.

3. Full-Scale Development

In this phase, the weapon system, including all items necessary for its support, is designed, fabricated and tested. The intended outputs are hardware models and the technical documentation required for initial provisioning of spare and repair parts. Technical and engineering problems which need to be solved are uncovered during this phase [Ref. 14: p. 45].

4. Production and deployment

During this phase, efforts are directed towards providing and maintaining the desired operational capability and inventory. Production of hardware, system deployment and establishment of support operations should commence as per plans. The ILS Plan is implemented as production starts. A systems oriented logistics support organization should be functioning by this time to meet the requirements of the operational mission.

C. A CONCEPT OF MODERN MILITARY LOGISTICS

The importance of military logistics has been recognized everywhere in the world. Many military scholars and organizations have tried to define military logistics in order to improve military forces.

In the current Turkish Army environment, an advanced military logistics system is indispensable to improve its military forces in order to continue its existence.

Therefore, one of the greatest current challenges facing the Turkish Ministry of National Defense is to develop more efficient operation of military logistics. Toward this end, the following paragraphs are intended to provide several new perspectives to military logistics as a background for the formulation of a concept of modern military logistics.

First of all, the concept of modern military logistics must be viewed in at least four dimensions. These are:

- Modern military logistics must contribute to national strategy.
- Military logistics must be recognized as a major segment of the military force.
- Military logistics must be studied as one of three branches of military science (the others being strategy and tactics).
- Military logistics must indicate the development of military organization [Ref 16: p. 344].

In order to derive the concept of modern logistics logistics must be viewed in the context of these four dimensions.

and higher skills to operate the sophisticated military equipment. Many citizens of Turkey will have to participate in direct and indirect military activity. Therefore, we have to mobilize not only our internal economic and industrial defense resources but also organize human resources as well. We have sufficient human resources but have insufficient material resources. In view of the characteristics of future conflicts and their military environments, we can say that one of the most important factors is more effective and efficient management of resources.

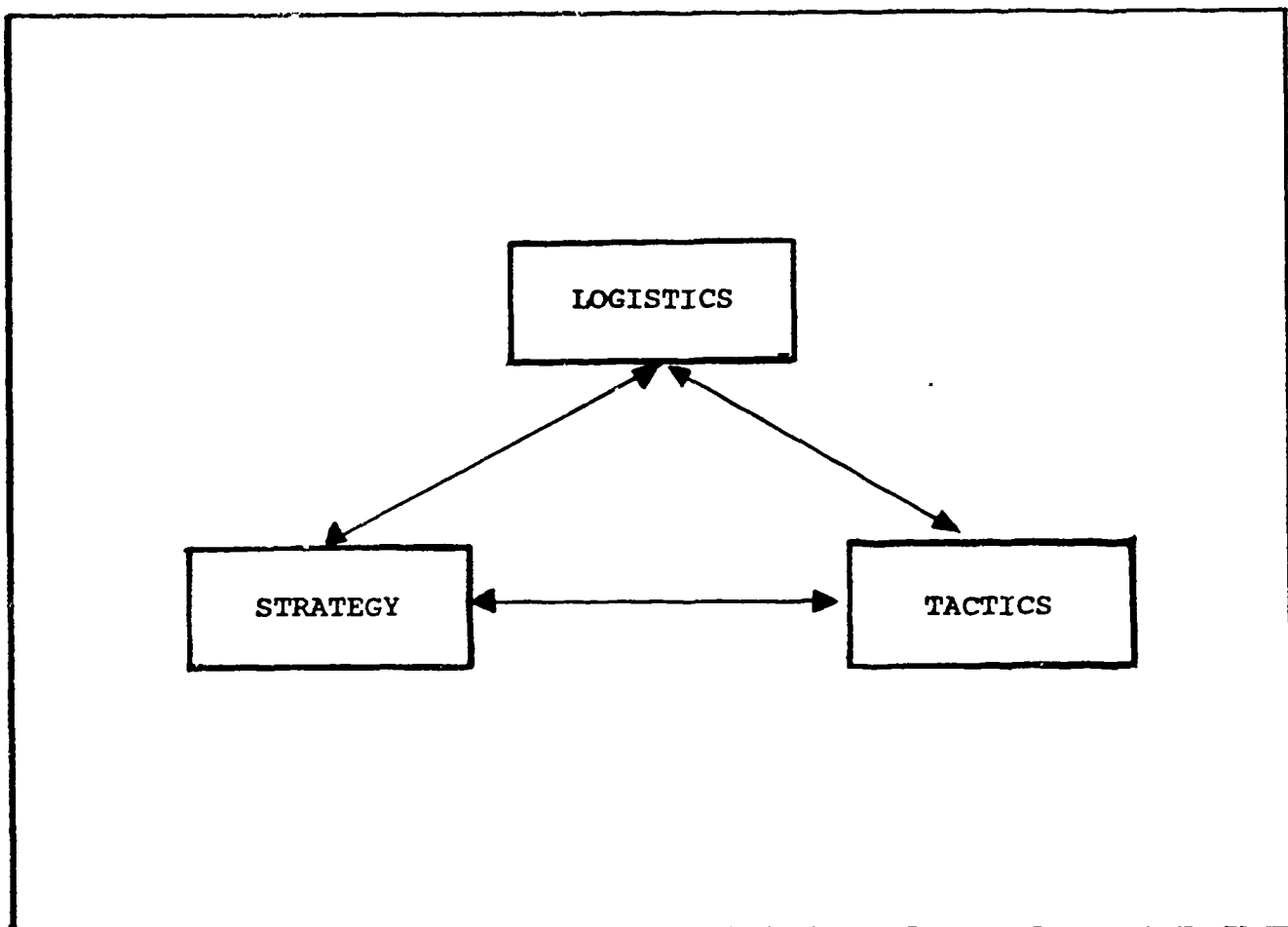
In a broad sense war is a combination of military political, economic, and geographic situations and considerations. We can find a blend of abstract terms, each of which is subject to a variety of meanings and descriptions, as well as to a variety of subdivisions; for example, geographic situations can include climate and weather, political considerations can include sociological aspects. However, military and economic considerations are related by logistics, because there is a military element within a nation's economy. Military operations also contain the economy element [Ref. 14: p. 148].

Turkey has been trying to establish a balance between the surrounding WARSAW Pact countries and Turkey in an effort to keep peace. Currently, the military forces of the surrounding WARSAW Pact countries are very much superior to that of Turkey. Turkey, therefore, has to improve its military forces. Turkey must make more efficient use of its military expenditures to obtain an improved military force. To establish these objectives, military logistics must be integrated across the military complex and the nation's economic elements.

The primary function of military forces is to wage some level of war, when called upon. In order to accomplish their primary function, military forces must always have the capability for armed conflict. In a broad sense, military capability includes force structure, force modernization, force readiness and force sustainability. Force readiness is the ability of whole military organization to rapidly mobilize deploy and fight. It includes the ability to receive units into the theater, integrate them into the operation and sustain them as long as necessary. To improve military logistics provides the technology to maintain the required high readiness levels and to sustain operations without outside assistance for reasonably long periods of time.

The logic of the statement that "the product of the total military logistics system is military capability" [Ref 16: p. 340] can be reaffirmed by the use of third dimension.¹ This is shown in Figure 3.6. It portrays a very simplistic view of the relations between the three branches of military science (Strategy, Logistics, Tactics) from a logistics perspective. Strategy determines the required level of military capability to meet "threat" through the statement of need (SON) or the mission element need statement (MENS). Logistics creates and sustains that required level of military capability, and tactics uses this military capability to wage war. Therefore, if military capability is the product of military logistics, then any activity, organization, or agency within the military forces which contributes to creating and sustaining military capability is in fact a part of the military logistics system (Environment) [Ref. 15: p. 124]. The relationship between the

¹Modern military logistics must be studied as one of three branches of military science.



TOTAL MILITARY ENVIRONMENT

Figure 3.6 The Logistics Connection (Author's Concept)

three branches can be differentiated between peacetime and wartime. During peacetime, planned strategies and tactics shape the requirements of military logistics through MENS, SON, and the level of combat training required. During wartime, military logistics limits and shapes the strategies and tactics that can be implemented through the amount and type of military capability it provides to the combat forces [Ref. 16: p. 175].

In that military logistics limits and shapes the strategies and tactics that can be implemented during the waging of the war, tactical and theater commanders must understand the ramifications of logistics decisions and actions. Therefore, in the formulation of strategies and tactics for and during the waging of war, some segment of that group would be better suited to have experience in and understanding of military logistics rather than experience in the actual operations of the weapons involved (aircraft, ships, tanks, etc). In war time a valid assessment of the enemy's "logistics capability" will provide a theater commander with a great deal more information, relative to the options open to the enemy, than only knowing the number and the placement of their forces [Ref. 16: p. 40].

In creating and sustaining military capability there is a natural order to the major operations (segments) of the military logistics system. This sequence is shown in Figure 3.7. The logistics systems, in the Figure's upper segment entitled "Weapons Oriented Logistics." It breaks this logistics environment into two major subsystems, which in total create and sustain military capability. System I, which is composed of the Research and Development (R&D) and acquisition operations, provides the potential for military

STRATEGY || LOGISTICS || TACTICS

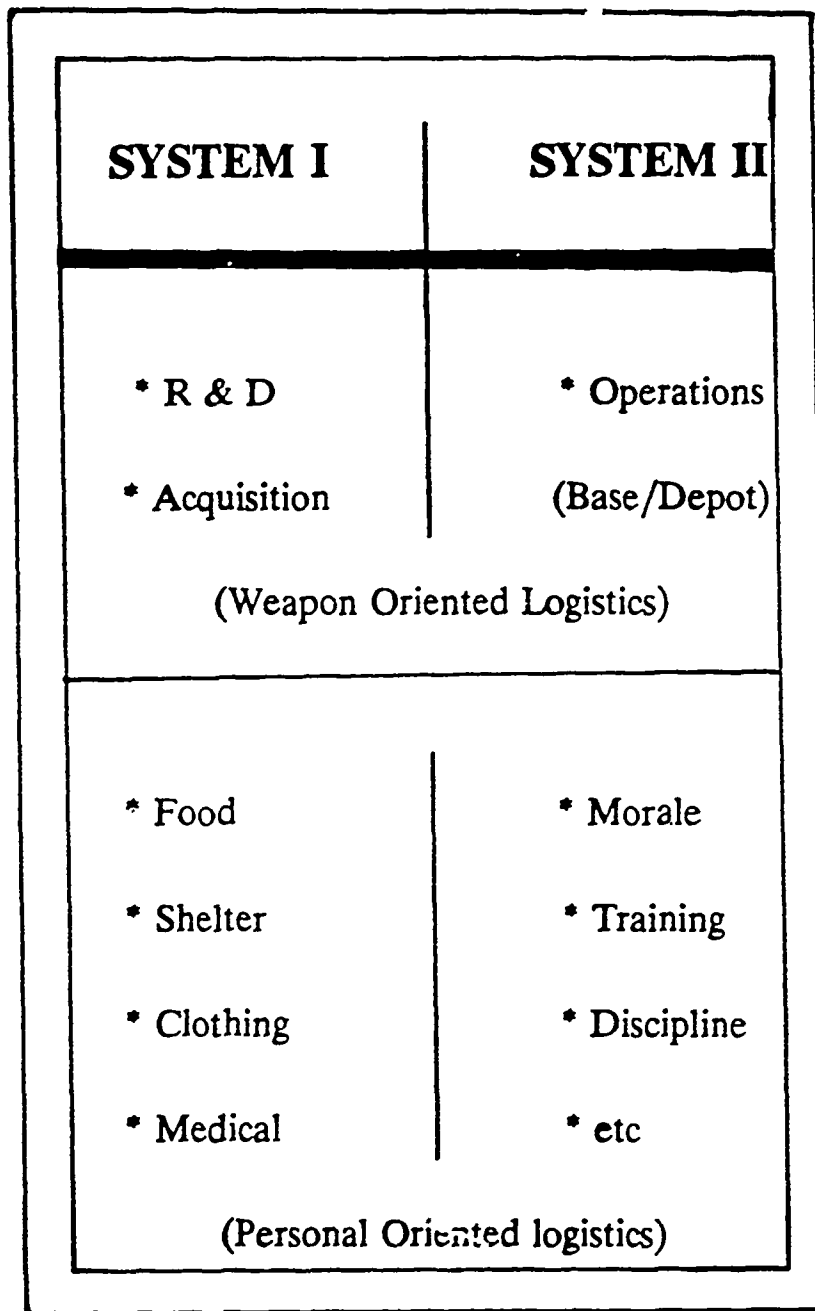


Figure 3.7 The Logistics Flow and Major Subsystems [Ref. 13: p. 120]

Development (R&D) and acquisition operations, provides the potential for military capability through the acquisition of military resources.² Military logistics has assumed a leading role in research, design, production, and system performance. The need to address total system life cycle cost (in lieu of acquisition cost only) is evident. Logistics support is a major contributor to life cycle cost - at least on the basis of those costs which are visible [Ref. 1: p. 19]. System II includes the base and depot level operations and assimilates those resources and creates military capability through its various functional activities³ and process. Personnel Oriented Logistics (POL) is contained in Figure 3.7 in recognition of the fact that it is part of the total logistics system. Although in the last several decades it has lost much of its visibility to weapons oriented logistics, POL remains an essential ingredient in both the accomplishment of logistics objectives and the primary function of military forces [Ref. 16: p. 112]. It is noted that good people can overcome the defects in logistics system, but even the best logistics system will not lead to satisfactory results without good people to operate it.

The preceding paragraphs delineate a few items of information necessary to understand the role, objective, and significance of military logistics, and establish the concept of modern military logistics.

In summary, modern military logistics is in fact the cornerstone of the military forces in that:

²Initial resources includes weapons, support equipments, initial spares, tools, test equipments, technical data and fuels, etc. [Ref. 17: p. 110].

³Functional activities include maintenance, supply, transportation, procurement and civil engineering [Ref. 17: p. 145].

- It deals with human and material resources;
- It is very concerned with today's military environment;
- It provides combat forces with the capability of waging war;
- It provides tangible evidence of military power in deterring a military threat;
- It limits and shapes the strategies and tactics that can be implemented during the waging of war;
- Its effectiveness directly impacts the cost and capability of military forces, and
- It must be integrated across the military complex and nation's economic elements.

In view of these facts, an acceptable definition of modern military logistics might be:

The integrated, artful and scientific management of those activities and resources necessary to create and sustain some required level of military capability to defeat against any kinds of enemy's attack. It does provide concisely the required art, science and integration of management concept, a general idea of its parameters and the objective - which it seeks to achieve the improvement of military forces [Ref. 18: p. 224].

The modern military logistics has come of age. It is time for military logistics become a major segment of the military forces in order to improve Turkey's self-reliance.

IV. INTEGRATED LOGISTICS SUPPORT

A. ILS SYSTEM AND ELEMENTS

This chapter presents an overview of the systematic developmental process employed to ILS planning with special emphasis on:

- The major considerations contained in the ILS elements;
- ILS policy directives, and
- The management of the ILS process.

The systems approach to material support problems is an outgrowth of the complexity, cost, and supportability requirements of material systems and associated equipment. Within the ILS systems approach, material systems and equipment and related support resources are referred to as primary systems or equipment and associated logistics support. ILS is concerned with the definition, optimization, and integration achieved by the systematic planning, implementation, and management of logistics resources throughout the system life-cycle. Blanchard describes the basic system life-cycle as "a developmental process with major interfaces between prime equipment and logistics support," illustrated in Figure 4.1 [Ref. 1]. During the life-cycle formulation phase, it is necessary to arrive at and document the major interfaces between the prime mission equipment and logistics support. Briefly, the system development process must satisfy a need or mission requirement within a prescribed operational environment. The system

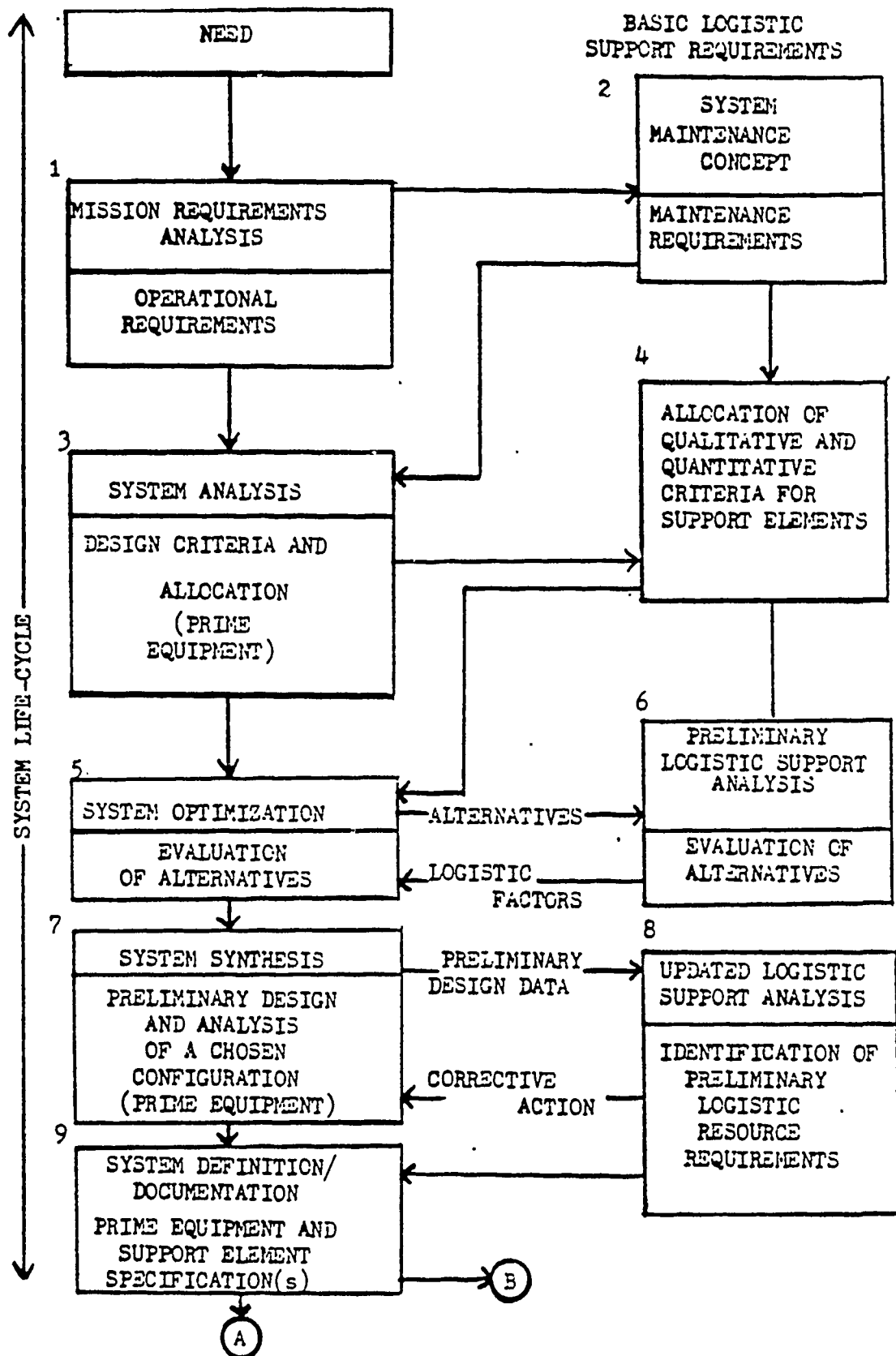


Figure 4.1 ILS Process [Ref. 1: p. 7]

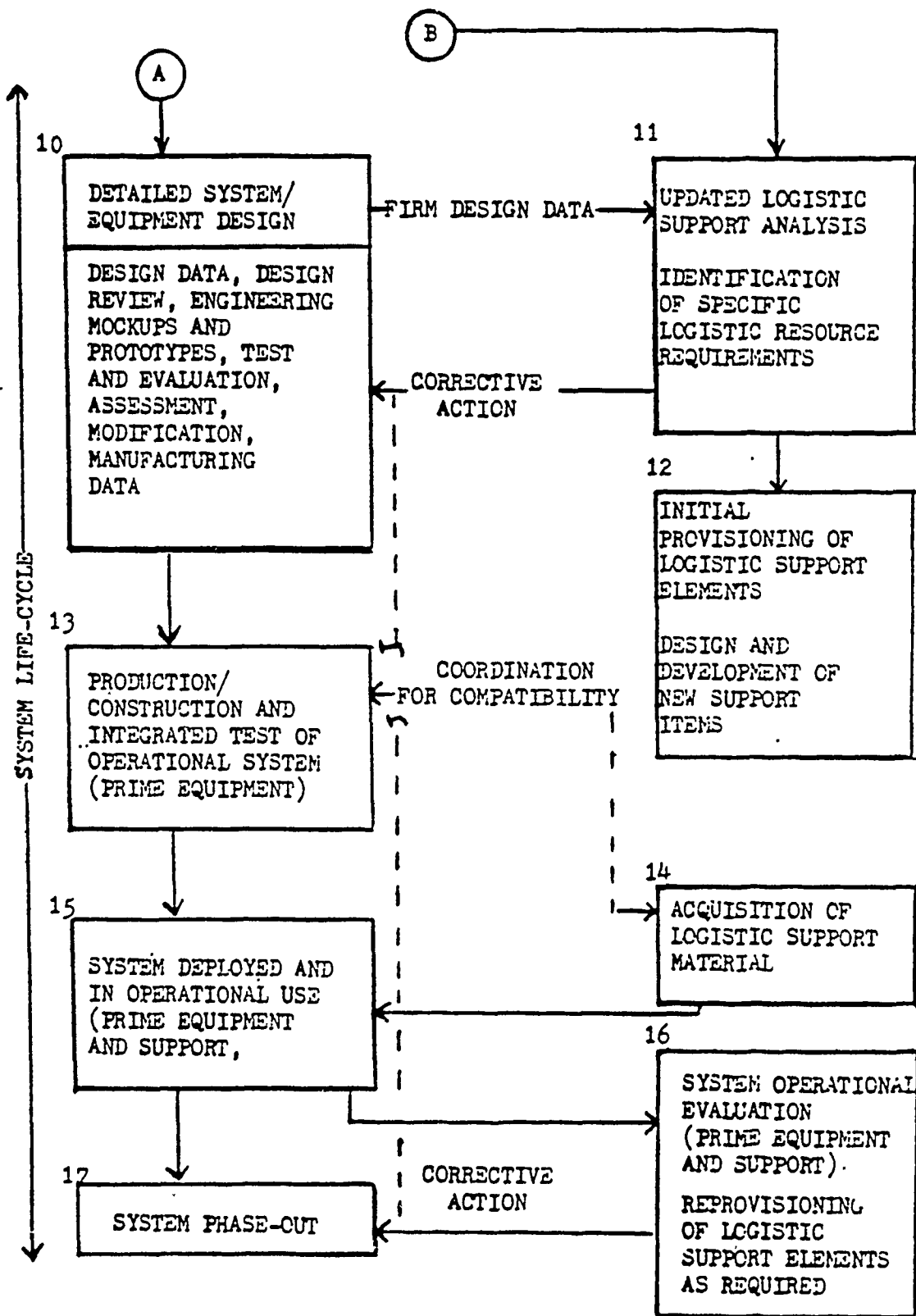


Figure 4.1 ILS Process (continued) [Ref. 1: p. 7]

maintenance concept is applied in terms of logistics support resource requirements. Alternative support configurations are evaluated and selected on the basis of tradeoff studies. During this process, areas such as reliability, maintainability, logistics, personnel, and training are analyzed on the basis of supportability, cost and system effectiveness. Finally, logistics data is collected throughout the operational life-cycle of the primary system or equipment to assess actual cost, system effectiveness and reprovisioning criteria [Ref. 3: p. 224].

However, designing a system solely to meet a specific need is not always sufficient. The system must be able to meet the need over a period of time so that the investment in time, funds and other scarce resources is justified. Thus, the system life-cycle originates a perception of a valid need, and terminates when a system becomes obsolete and no longer satisfies mission requirements.

In essence, ILS is a management planning discipline. It provides controls that help ensure that a system or equipment item will meet performance requirements and that it can be supported throughout its life-cycle.

Cleland and King advocate a systems approach for more efficient decision-making and organizing in the day-to-day management of an organization's activities. This approach stresses the use of objective analysis in decision-making problems which permit consideration of alternatives in the allocation of resources while attempting to achieve organizational objectives [Ref. 17: p. 17]. The introduction of systems analysis ideas to the framework of solving complex logistics problems is reflected in the steps illustrated in the development process (Fig 4.1) [Ref. 18].

Planning for the logistical support requirements begins in the primary system or equipment concept stage. An ILS program or plan should be formalized so that deletions or changes due to inaccurate or missing data are minimized. When the requirement for ILS planning proceeds from the concept stage to the operational stage, the logistics support plan is developed by the ILS program or project manager whose focus of attention is on program goals, rather than on any singular element such as training or supply support. Thus, the program manager operates through functional areas and personnel in directing the allocation of resources which are involved in the process. For example, the acquisition of ten radio systems for howitzers of the same class which are built by different howitzer builders calls for program planning which staggers delivery and installation so that necessary resources are available prior to the installation of radio system. The need for the right test equipment, personnel, and power requirements necessitates careful planning and coordination on the part of the ILS manager who cuts across traditional functional lines to bring together the resources required to achieve program objectives [Ref. 12: p. 244].

Ideally, the ILS planning, programming, and implementation document will address each of the basic logistics elements to the extent required to ensure supportability and capability testing prior to the production or acquisition of the end item itself. These elements are displayed as a flow in Figure 4.2 and described more fully above.

1. Maintenance Plan

The maintenance plan is a continuing effort which interfaces with all other ILS elements. It is given greater emphasis and overshadows the other ILS elements.

FLOW OF INFORMATION

ELEMENT

FLOW OF MATERIAL

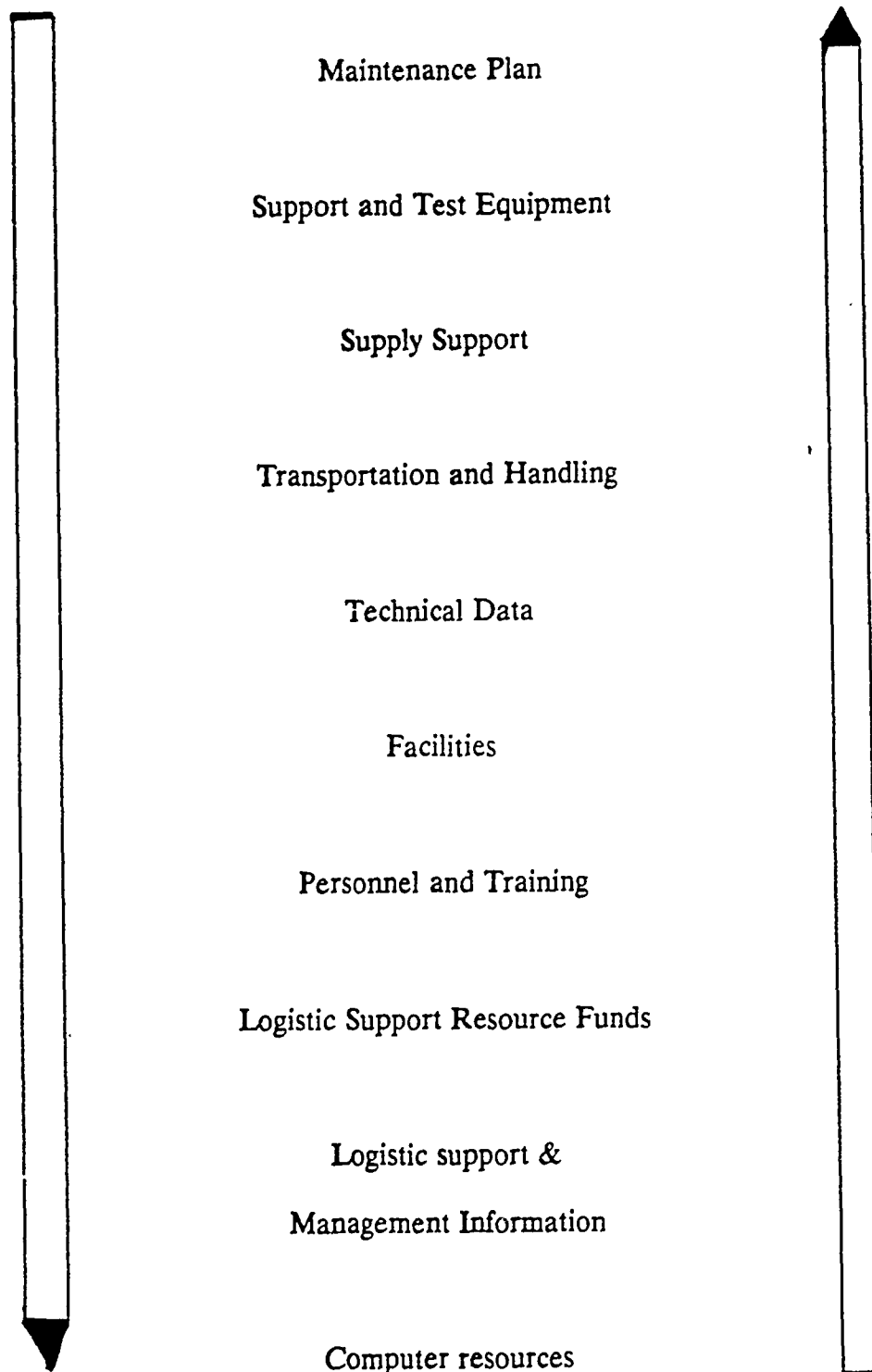


Figure 4.2 Integrated Logistics Support Elements (Author's Concept)

The plan itself is a description of the requirements and tasks necessary to achieve and maintain the operational capability of the prime system or equipment item. The maintenance capability of existing organizations include the user, civilian contractors, and depot level maintenance activities. This is accomplished through the use of maintenance engineering analysis. Various maintenance concepts are reviewed. The concepts should identify levels and locations of maintenance and prescribed maintenance programs. Technical data files should be considered as to the depth and availability of maintenance at the location under review. If the technical data is not available to the maintenance technician, even the best designed system will fail.

Tradeoffs and analysis as an expression of frequency or repair should be considered within the maintainability and reliability parameters. Varied combination of performance requirements and maintenance capabilities are evaluated to determine the optimum maintenance approaches. In this regard, communication and coordination with the user must be maintained to ensure that the maintenance is appropriate for the skill levels of the people performing the maintenance.

2. Support and Test Equipment

The purpose of support and test equipment is to ensure that the required support and test equipment is available to the user and supporting maintenance activities. The ability to perform scheduled and unscheduled maintenance depends upon the adequacy of the support and test equipment identified or developed concurrently with the primary system.

The cost of support and test equipment in some systems exceeds the unit cost of the item. For example, the use of disposable products, calibration and test equipment might well over time exceed initial investments costs. That is, the number and cost of support and test equipment items may exceed the number and cost of the primary systems or equipment items.

ILS elements are designed to ensure that all essential items for maintenance are available when required. The system design and existing support and test equipment are analyzed to ensure that standard or common use equipment already developed is used whenever possible. This obviates the necessity of developing additional support and test equipment. The basic design of many complex systems now also incorporates built-in test and calibration equipment. Though the initial cost is increased, effective built-in evaluators lower total life-cycle cost.

Testing of the primary system by the user with these features in the projected operational environment should be included as part of this ILS element. Systems or equipment items may function very well at a fixed base, but when installed in vehicles or moved about in the field, the requirements for supportability may be very different. This fact should be included in design analysis. Management receipt of user data, on-site visits, and feedback reports provide the means for continuous monitoring and evaluation of support equipment throughout the operational phase.

3. Supply Support

Maintaining operational readiness under diverse conditions of use depends directly on the availability of the proper supplies at the time and place needed. Supply

support is an essential element of the logistics integration effort and is responsible for the timely provisioning, distribution, and inventory replenishment of spares, repair parts and special supplies.

The supply of items needed to support primary systems depends upon the design of that system and how well they are maintained. If an item is designed to be maintained at the user level according to the maintenance concept, adequate repair parts should be allocated and stocked at the user's organizational level. If designed for depot level repair only, the user organization may require fewer repair parts, if any. The idea is to allocate the support to the proper level. A contrast could be made here by comparing fleet and field use as opposed to fixed base use where there is a better access to spares and repair facilities.

The reliability of a primary system or equipment component is determined prior to forecasting repair parts or spares. Tradeoffs between additional costs for design improvements versus costs of more spares at lower reliability should be evaluated. Throughout the acquisition cycle, supply support functions may change depending upon who provides support of a particular item and where maintenance will be performed. Review, approval, or readjustment of the contractor's recommended spares, repair parts, and special supplies should be accomplished. This is done in response to the maintenance plan and in consideration of experience with like equipment.

Interface with the ILS technical data element must be established to ensure that supply publications reflect the support concept as to level or repair, source of item, or any other management data appropriate to the primary system or equipment. It is especially

important to identify long-lead time high-value support items for stockage. This process requires management attention throughout all phases of the equipment life-cycle.

4. Transportation and Handling

As the system support develops, this element includes detailed characteristics, actions, and requirements necessary to ensure that the capability exists to transport, package, and handle all equipment and support items. An analysis of transportation channels and storage availability as well as the policy governing use is required. Further, containers for costly sensitive components are considered. The design of these containers should consider protection, weight, reusability, and quantity.

5. Technical Data

The element of technical data deals with a systematic process for developing, printing, and distributing primary system and equipment publications. Technical data provides the link between personnel and equipment. The publications provide the necessary information on installation, operation, maintenance, supply, and repair. It has long been recognized that complex materials cannot be employed effectively without adequate equipment publications. A detailed schedule must be developed to ensure the availability of appropriate instructions on a timely basis. Manuals should be designed so as to be understood at the skill and intelligence level of user. Complicated engineering schematics and repair manuals are useless if the operator or maintenance technician cannot read or interpret them correctly. This element is becoming even more acute as systems and equipment designs become increasingly complex.

Review by the user is important and should include verification of actual performance of the operational and maintenance procedures set forth in the publications. In addition, this review should be coordinated and planned before technical publications are approved and accepted. Disregard of a reviewer's comments due to the time constraints can lead to very unsatisfactory publications.

6. Facilities

The purpose of the facilities element is to ensure that required facilities are available to the users and supporting activities. If not, action is taken to modify the existing facilities or to construct new ones.

Facilities planning is limited to an analysis of support requirements for all categories of maintenance to ascertain the need for standard, new, or unique types of facilities arising from new requirements. This planning is based upon equipment design, locations, space needs, environment, personnel interfaces, and frequency of use. Also, some primary systems or equipment items may require special power sources for equipment operation, temperature and humidity control, and communications. Each of these considerations must be weighed in conjunction with the design parameters, maintenance concept, and operating support requirements. Facility planning requires support management attention throughout the life-cycle to provide positive coordination with other ILS elements.

7. Personnel and Training

This support element includes identification of the requirements for personnel to operate, maintain and otherwise support the end item or system. As with any of the elements, even the best designed system can malfunction without appropriate support. The maintenance concept for the primary system will dictate the number and skill level of maintainers required at various locations. If contracted maintenance is called for at a particular level, requirements for specific training are reduced. However, assurance must be given that support services are adequately provided during contracted maintenance periods.

8. Logistics Support Resource Funds

The cost of logistics support for systems has been growing each year, although the control and estimate of projected costs is difficult to ascertain [Ref. 10 p.166]. As such, inaccurate estimates, or new or unfunded requirements, can result in tardy requests for additional funds or changes in schedules, which may indicate poor program management. Further, the political framework generally impacts on program management and funding support, affecting all ILS elements and program completion. Better control of support funds, more realistic forecasts, and a thorough understanding of the political process, i.e., the availability of financial resource, is essential for program success.

9. Logistics Support and Management Information

Material support is dependent upon the management information process for data with which the manager analyzes and evaluates equipment performance with respect

to support implications. Logistics management information is valid if it can track or indicate potential problems of cost, scheduling, or performance, many reports show operating hours, periodic maintenance performed, failure rates, time to repair, and test results. Any combination of report criteria or feedback may be designed, but planners must not simply duplicate other information systems. They should be specific and continuously review report data requirements. Information must be available in meaningful, readily accessible form, or too much time and effort will be expended in accessing the information.

10. Computer Resources

This facet of support refers to all computer equipment and connected resources, software, program tapes/disks, data bases, etc., necessary in the performance of various maintenance functions at each level.

Early in the development phase of the acquisition life-cycle, support management selectively identifies the extent to which the above information systems will be required during the item's life-cycle, when they will be required and how and by whom the requirements will be met.

It is now almost universally accepted that the successful operation of most advanced weapons systems is dependent on embedded computer resources (ECR). Nowadays, ECRs are used to operate systems, to test them, to produce them, and to keep them responsive to changing threats. Program managers use ECRs to monitor system failures, cost overruns, and schedule slippages.

Software development requires the same amount and extent of skill as required in hardware development. Equal emphasis on software and hardware should apply from the beginning. The ECR must be evaluated for its supportability:

- Common high order language;
- Availability of compilers;
- Transportability of coding, etc..

In short, system software should be treated as a vitally important configuration item just as much as any other element.

11. ILS Contribution

The purpose of describing the ILS elements is to show that the concepts are applicable to any primary system is developmental process. Within the artillery community, ILS planning could provide improved visibility to support requirements essential for improved life-cycle costing and systems analysis trade-offs. This means in essence that both the primary system and the logistics support system are considered together during planning and development, acquisition, and operation.

No ILS element can stand by itself or provide answers to all questions concerning primary systems and equipment support. The more complex the items, the more detailed the support, and the greater the interface required between the elements and care taken in the maintenance engineering analysis phase. Overall the ILS management system provides a framework for organizational integration which fosters total systems

contributions in terms of life-cycle costs relevant to performance and mission requirements.

E. MANAGEMENT RESPONSIBILITY FOR ILS PLANNING

In the U.S. Army, the Commander of the Army Material Command is responsible for establishing specific policy and procedures for the uniform application and execution of ILS planning by its functional and Project Management Organizations [Ref. 12: p. 118]. Briefly, the specific responsibilities are:

- Designation of a single Headquarters level organization for ILS policy, and assigning to it the responsibility to establish, maintain, and monitor a system that assures timely and adequate ILS planning; implementation of U.S. plans; acquisition of required logistics support resources.
- Designation of an acquisition manager for each system and equipment for which the headquarters and field activities are responsible.
- Designation of an ILS manager for each system and equipment for which the headquarters and field activities are responsible.
- Ensure that sufficient funds are budgeted and made available for ILS feasibility studies, trade-offs and planning.
- Ensure that responsible activities initiate timely and appropriate procurement and funding actions.

1. Project Manager

As regards implementation of ILS policy, the project managers are required to establish a visible and viable ILS organization. They are to use the planning documents to adopt an early and effective approach for achieving ILS for their projects. A project manager is also required to produce an ILS plan and identify the logistics element

managers for each ILS element [Ref. 12: p. 115]. Generally, important actions required of all project managers are:

- Commence ILS planning concurrently with hardware planning.
- Ensure that planning documents contain ILS requirements inappropriate to the phase of acquisition.
- Develop and maintain an ILS plan.
- Ensure that all required parties, including representatives of various commands and organizations, and others as appropriate, participate in the planning process.
- Ensure that necessary conditions exist between and within each organization which provides a logistics element manager and logistics resources.

2. ILS Manager

The ILS Manager is responsible for developing quantitative and qualitative support system requirements for inclusion in appropriate project management and contractual documents and ensuring that these requirements are addressed as an integral part of design process. An ILS manager is to:

- Assess the logistics development data for the system in order to determine the extend of the required logistics support and develop a plan which adequately provides this support.
- Specify the quantitative and qualitative requirements which must be met to achieve the system support capability.
- Organize and chair the ILS management team.
- Act as the agent for the project manager in all logistics matters.

3. Logistics Element Manager

The logistics element manager is appointed by the Army Material Command, and is basically responsible for ensuring that adequate planning for and availability of the ILS element (e.g., supply support, technical data, facilities, personnel and training) is accomplished in accordance with milestones reflected in the ILS plan. Additionally, he is to maintain close coordination with the ILS manager and all other element managers and provide appropriate quantitative and qualitative inputs to the ILS manager. For example, he provides information on planned and actual:

- Repair turnaround time;
- Mean time to repair;
- Automated versus manual fault isolation;
- Maintenance data display techniques;
- Supply response time;
- Maintenance personnel and training projection;
- Facilities constructor lead time.

The organizational integration discussed in the previous section can best be accomplished by the early assignment of an ILS manager to a designated program or project office [Ref. 12: p. 66]. This manager is responsible for assembling various logistics element managers into an ILS matrix organization.

An ILS program or project manager's role is to work across functional lines so that tasks may be interrelated. Cleland and King advocate the use of matrix

management as an aid to the manager to pull functionally separate activities together to attain goals and to resolve problems in large complex organizations [Ref 13: p. 160]. Matrix management is no panacea, but it does provide a means of controlling various undertakings. Functional managers exercise technical authority over projects, while product managers have responsibility for budgets and the final completion of projects. The functional managers lend staff members to product managers as needed [Ref. 12: p. 128].

Managing logistics with this matrix design could help organizations meet the dynamic logistics needs of the artillery community. A matrix organization can establish a flexible system of resources and procedures to accomplish a variety of programs and project objectives. As projects are completed or canceled, they are deleted from the organization. The program manager is given the authority, responsibility, and accountability for completion of project. The manager is assigned with appropriate qualifications from functional areas for completion of the project. Thus, the project organization is composed of the manager and functional personnel groups.

Other circumstances in which project or program management techniques may be employed are:

- Special projects within a segment of the organization;
- Non-routine or unfamiliar organizational endeavors;
- Feasibility and developmental studies;
- Integration of functional elements and outside organizations;
- Changes to plans requiring organizational flexibility, and

- Objectives involving many people and independent organizations [Ref. 12: p. 128].

The matrix organization provides a framework for incorporating ILS elements and projects into a traditional functional organization. It permits the organization to develop and implement a number of projects while enhancing management control. Project management may not be adaptable to all situations and depends on the magnitude of the effort, complexity, familiarity, interrelatedness and, above all, organizational policy. Management then must tailor the logistics events and management activities to their particular system by specifying assignments and responsibilities.

C. SUMMARY

This chapter reviewed the ILS elements and management responsibilities for better understanding and implementation of ILS.

In the next chapter the author will apply and implement Integrated Logistics Support for Turkish Army.

V. ILS IMPLEMENTATION BY TURKISH ARMY

A. INTRODUCTION

Presently Turkey does not have the capacity to satisfy all its military needs internally, due to the lack of domestic resources. More relevant is the peculiar fact that Turkish industry has never launched a prototype development of a major weapon system for the defense forces. Consequently, Turkey has resorted to procurement of military hardware from friendly countries to meet its military needs. In this situation, the choice is between the purchase of systems which have already been produced or those which are in an advanced stage of development or production.

In selecting a system for procurement from abroad, the major issue is deciding from among the number of systems available for sale by friendly countries. Usually the procurement decision is based upon procurement costs so the tendency is to buy the cheapest systems.

B. APPLYING ILS AND ILS PLANNING

Integrated logistics support is a widely misunderstood system life-cycle discipline. Yet ILS directly affects many important aspects of system acquisition, including such considerations as the control of program costs, full funding for priority programs, and a balance between cost and quantity. The effect of ILS is most pronounced on testing and decision making, prior to initial acquisition, during the preliminary consideration phase.

Application of ILS becomes more critical as system complexity increases. Increased system complexity requires more logistics support because of the increased number of components in the complex system.

1. Application of the ILS Concept

ILS provides the framework for the planning and execution of equipment development and acquisition to assure supportability and optimum life-cycle cost. To be effective, it must be applied very early in the development phase, normally during concept formulation, to evaluate the general support requirements that could result from various design alternatives. From the author's personal experience, careful planning before buying a weapon system would have solved various problems involved with bringing the eight-inch howitzers into the Turkish Army.

The support requirements must be determined. These support requirements have a far-reaching effect on the life-cycle cost of a system since the cost of operation and maintenance in a 10-year period exceeds the acquisition cost many times over. As a consequence of inflation and a tendency toward increased equipment capability and sophistication, these costs accrue at a greater rate each year. Without adequate control, these costs can erode the fiscal ability to develop and produce military material because actual costs will exceed the planned costs. This in turn will cause a huge deficit in the defense budget so the government will tend to stop some of the projects to avoid this problem [Ref. 19: p. 149].

When the material system enters the full-scale development phase, the emphasis of the ILS program centers on detailing support resource requirements,

finalizing support concepts, and validating these requirements and concepts. Alternatives to the various elements of the support system must be analyzed and evaluated. And the supportability of the material system must be demonstrated to ensure that the system meets Army supportability requirements.

During the production and deployment phase of the material systems' development, the validated support system elements, including such items as maintenance manuals, tools, and repair parts, must be acquired and deployed. The lack of proper and timely repair and spare parts support would be prevented by acquiring and deploying the support elements such as maintenance manuals, tools, and repair parts before bringing the eight-inch howitzers to the field.

After deployment, equipment performance, maintenance, and cost data must be collected, evaluated, and used for current maintenance management procedures. Such data must also be retained for use in product improvement and in future deployment programs. The equipment performance must be evaluated and tested by authorized personnel before bringing the system to the field. This would have solved the problem the author faced when he was ordered to perform the test firing of the ammunition purchased for the eight-inch self propelled howitzer. (See Chapter Three).

The objective of this ILS process is to ensure that users receive a system that performs well, to ensure that the system is adequately supported, and to reduce the cost of ownership of the system throughout its life-cycle. The ILS process serves these objectives by influencing the acquisition of material systems to ensure that they are reliable and maintainable - and by timely planning, development, acquisition, testing, and

deployment of required logistics resources as an integral part of the material acquisition process. Properly applied, ILS can improve system performance and availability, and it can minimize schedule delays and cost overruns by planning support actions rather than acquisitions [Ref. 20: p. 86].

Integrated logistics support does not end with concept formulation. It becomes more ubiquitous as an item proceeds through its development phase and production. A smooth transition to the initial deployment of a system is a direct result of ILS planning and implementation. Lower system operational and maintenance costs in the field are related to the competence and dedication of maintenance engineers and specialists involved in a system's development. In brief, the development of a supportable system with a low life-cycle cost is not a stroke of luck. It is the result of an arduous process that must be systematically pursued throughout the acquisition phase [Ref. 18: p. 155].

2. ILS Planning

The reliance on sophisticated equipment rather than on sheer manpower in future combat situations emphasizes the necessity for good logistics planning and places real importance on the integration of logistics consideration in the design process.⁴

Prior to the advent of ILS, operational performance was the only meaningful design parameter for new systems and equipment. Success of newly fielded systems was based on pure performance characteristics, such as a range, speed, and payload. Logistics support was provided as an afterthought or after the design was so far along that

⁴Lecture conference, "Introduction to Integrated Logistic Support," Army Logistic Management Center, Ft. Lee, Virginia.

significant changes could not be made. The need for superior equipment is valid both today and for the foreseeable future, however, suboptimization of operational performance has been accomplished unwittingly at the expense of logistics support.

In the mid 1960's the emphasis on suboptimization of operational performance was recognized among the logisticians in the U.S. and there was a turn-around in logistics support philosophy. Factors contributing to this turnaround were:

- Operating costs exceeded acquisition cost;
- Unacceptable availability rates for major systems;
- Excessive maintenance repair times;
- Inability of the standard supply system to provide adequate support [Ref. 20: p. 28].

The purpose of the ILS program is to provide operational readiness and logistics support management while minimizing operating and support costs. The irony of this is that the expressed purpose is achievable. The key continuing objectives for this purpose are:

- Integration of logistics considerations into the design;
- Timely availability of all required logistics resources [Ref. 20: p. 118].

Since ILS in the U.S. has demonstrated a successful approach to logistics management, this author feels that it would be the best solution to solve Turkey's

problem. The following section discusses the U.S. Army's Integrated Logistics Support Plan (ILSP)⁵ to illustrate the ILS planning process.

As the ILS program progresses, the updated task requirements become more specific. The ILSP is inherently dynamic, yet it must be flexible enough to ensure the best overall balance among operational support elements. Figure 5.1 illustrates the ILSP outline [Ref. 20: p. 88]. ILSP is divided into three basic parts:

1. General System Description, Program Management, and Applicable Documents.

- System description - A brief description of the system, its components, purpose, and general performance characteristics. For example, for a eight-inch self propelled howitzer the description would include details such as: diesel engine driven, self propelled and a eight-inch barrel. The purpose would explain its intended use, general performance characteristics, and the system's unique features.
- Program Management - Identification of all participating organizations and level of program review. Participating organizations would constitute the appropriate project product manager. Development of major systems would require either a Defense System Acquisition Review Council (DSARC) or Army System Acquisition Review Council (ASARC), while non-major systems would be limited to a local in-process review (IPR).
- Applicable documents - A listing of documents which provide guidance for the functions described in the ILSP. Some examples of the types of documents are: Army Regulations, Department of the Army Pamphlets, Military Standards, Justification for Major Systems New Starts, and Required Operational Capability [Ref. 20: p. 102].

⁵ILS Plan described in this thesis is based on AR 700-127 [Ref. 22]

PART I : GENERAL

1. System description
2. Program Management
3. Applicable Documents

PART II : CONCEPTS AND STRATEGY

1. Operational and Organizational
Concepts
2. Acquisition Strategy
3. Logistic Support Analysis
4. Test and Evaluation Concept
5. ILS Elements
6. Logistic Support Resource
Funds

PART III : ILS MILESTONE SCHEDULE

Figure 5.1 Integrated Logistics Support Plan [Ref. 11: p. 140]

2. Concepts and Strategy.

This part is the focal point of the ILSP. It describes the basic concepts and the strategy for their achievement listed below:

- Operation and Organization (O&O) Concept - This concept is expressed in terms of mission scenarios, work environments, deployment plans, and support force structures. Examples of some of the concept concerns are; mission scenario - annual operating days and duration; work environment - ambient temperature; deployment plan - basis of issue; and support force structure - skill levels of support personnel.
- Acquisition Strategy - This subsection briefly describes the acquisition approach and relates the total acquisition strategy to the ILS program. It also addresses budget and funding plans that differ from standard procedures, i.e; support cost guarantees, reliability improvement warranties, design-to-cost, and life-cycle costs.
- Logistics Support Analysis (LSA) - LSA is required in all material acquisition programs. By regulation there are no exceptions. LSA is, however simple, an analysis that results in a description on the scope and level of manpower and logistics support.⁶
- Test and Evaluation Concept - This subsection describes specific test requirements directly; for example, reliability and maintainability, support personnel and skill requirements, training requirements, special tools and equipment, and adequacy of publications [Ref. 20: p. 130].

3. ILS Milestone Schedule.

This schedule shows the logical event-oriented sequencing for specific ILS tasks and events. The dates assigned are coordinated by the ILS manager for overall system planning to ensure integration into the material acquisition process. This schedule then becomes the baseline for logistics considerations and planning in the material acquisition process.

⁶AR 700-127, "Logistics - Integrated Logistic Support," 1 April 1981.

Finally, the concepts, procedures, and processes of ILS planning are not a panacea for all the problems associated with the acquisition and support of new equipment. However, they do provide a system for the integration of logistics considerations into the design and the assurance of timely availability of all required logistics resources [Ref. 20: p. 140].

C. MAKING ILS FEASIBLE

The incorporation of an ILS concept in any major weapon system or equipment acquisition by the Turkish army appears feasible. However, immediate implementation may not be without the ups and downs which are usually faced by a new concept. The main hurdle in Turkey may be convincing the government of the long term advantages of buying the system which has the least life-cycle costs, especially when these costs are spread over a time horizon of 10 to 15 years. In addition, computing the life cycle cost (LCC) in a small country like Turkey, may not be practical because of an insufficient defense budget. Necessary cost elements are difficult or impossible to obtain.

Even without being able to determine the LCC, the ILS concept and plan can be developed. The ILS concept has to be introduced at all levels of management as a first step. Plans for more effective support of howitzers and units now operational may also be developed to the extent allowed by the available budget. Training personnel in the field of configuration management, information systems and planning for integrating support requirements which is pragmatically possible has to be started as the next step.

Training assistance from the United States may be sought, as a sequel to the above, in the practical coaching of personnel for acting as Logistics Managers, in case ILS applications are needed in future acquisitions of ships or systems.

In the procurement of weapon systems from abroad, preferences must be given to weapon systems which have ILS planning in their acquisition, since these systems have far more chances of receiving a better follow-on-support than other systems which lack appropriate ILS planning.

D. ILS RESPONSIBILITY IN THE OPERATIONAL PHASE

ILS as a system is still evolving. Even in the United States, the responsibility for implementing ILS after a howitzer unit embarks on operational duty is not clearly defined. A need exists for tasking an agency which is suitably equipped in terms of control and data information, to ensure initial deployment.

When the Turkish army decides to implement an ILS program in the future, a suitable directorate under the Assistant Chief of Army Staff (Supply Services)-ACNS(S)- should be able to handle the job of continuation of ILS efforts after a program office closes down. This would require an ILS cell equipped with current logistics data pertinent to the existing weapon systems. Such a cell can also look after the configuration control of the systems, since it is a closely related function. The proposed ILS cell, while remaining functionally under the ACNS(S) could be put under the administrative control of the Commander Logistics (COMLOG) (the flag officer responsible for maintenance and

other logistical requirements of the fleet) and thus be in a good position to provide liaison between the units, and the army stores depot.

VI. CONCLUSIONS AND RECOMMENDATIONS

A. SUMMARY

The requirement for logistics support over the life cycle of a weapon system was described in Chapter I. The importance of logistics support on the effectiveness of any weapon system is stressed and, more importantly, the impact of logistics support on cost effectiveness over the entire life cycle of the system is mentioned. It was explained that the supportability of weapon systems becomes complex as the system gets more sophisticated. The predicament faced by the Turkish Army, in having to maintain costly systems without adequate logistics support planning, was then discussed.

In Chapter II the strategic location and the value of Turkey as of NATO's southeastern defense were discussed. Turkey's current military logistics problem was defined and the alternatives to solve the problem analyzed.

Chapter III focused on the establishing of an integrated logistic support concept. In Chapter IV the elements of integrated logistic support and management's role in the ILS process were explained. Among the directives issued by the U.S. Department of Defense, an important step forward in ILS implementation was the publication of the ILS Planning Guide for DOD Systems and Equipments [Ref.16]. This planning guide represented a major improvement in the engineering process for new defense systems. Its goal is to provide a proper balance between operational, economic and logistics factors. Apart from presenting a systematic management approach to the early integration of support criteria

into design activities, the guide also identified the interrelated elements of logistics support that required project type management. In short, the planning guide serves the purpose of a tool kit for the use of program managers, designers and logisticians and is an aid to tailoring logistics plans and actions in support of equipment readiness. In addition to defining important terms pertinent to ILS, this chapter also dealt with the application aspects of integrated logistics support describing the system for acquiring ILS and the management responsibility for the support planning in an acquisition program.

Chapter V focused on the application and implementation of integrated logistics support.

B. CONCLUSIONS

ILS is concerned with management of life cycle support of the complete weapon system from cradle to grave. Support requirements are considered, planned, and budgeted for concept development, system design, production, and through the resources necessary to support the system, and makes supportability a design requirement as important as cost, schedule, and performance. Alternative support concepts, tradeoffs between design criteria and ILS elements are made to achieve optimum support for the system. The integrated logistics support plan reduces uncertainty in support planning and ensures the right resources at the right place at the right time.

The life cycle cost of weapon systems can be reduced by the implementation of integrated logistics support. There are up front costs associated with an integrated logistics

plan effort. While these costs yield significant long term benefits, they must compete, today, with expenditures which yield near term returns.

Planning ILS for the life cycle support of a weapon system is a difficult task, but its long term benefits are both lucrative and rewarding. Incorporation of the integrated logistics support concept in any future major acquisition should relieve the Turkish Army of many of the current follow-on support problems. Accordingly, the Turkish Army must base its choice of procurement of a weapon system on whether ILS is available and has been incorporated as a program in that particular system.

C. RECOMMENDATIONS

The Turkish Army has to concentrate on the development of an ILS system which can be considered to increase the operability of forces and enhance their readiness. ILS comprises all the support considerations necessary to assure the effective and economical support considerations necessary to assure the effective and economical support of a system or equipment at all levels of maintenance for its programmed life cycle. Development of ILS for a new system or equipment should be initiated concurrently with the performance requirements at the earliest possible time in the conceptual phase. Moreover, the evolution of logistics support should be the result of progressive systems analysis of the plan for use and the plan for support and the indicated tradeoffs between these plans. Therefore, the Turkish Army can take advantage of the ILS process as a management tool in developing life-cycle logistics support during the acquisition cycle.

There is a need for increased ILS education for Army logisticians. Key officers should be identified who are motivated to perform in this important area.

An ILS Management team must be established. Further, formal courses on ILS planning should be investigated as to availability of quotas.

There is a need to review existing U.S. Department of Defense and U.S. Department of the Army ILS policies as the state of the U.S. and Turkish armies are very similar. The operations of certain functions and processes of current logistics management of Turkish Army should be reviewed to determine whether they are being performed effectively.

There is a need for more timely and accurate maintenance management information. A computerized data management system should be established to manage and keep track of information and be able to update the current status of the troops support requirements.

Implementing integrated logistics support for Turkish Army will lead to a more efficient and effective Army in the national defense of Turkey. ILS will decrease life-cycle costs and will improve availability.

The development of ILS planning techniques, along with inevitable organizational and procedural changes, is an evolutionary not a revolutionary process. Relatively slow acceptance and implementation in the services or industry may be expected, possibly due to the size of organizations involved and the natural reluctance of people to make changes. Participation and intense interest of the top planning hierarchy of the Turkish Army would ensure a speedy implementation of the ILS concept.

The Turkish Army should incorporate an integrated logistics support concept in the acquisition of future weapon systems process. ILS planning in the acquisition of new purchases should yield considerable benefits throughout the life of these purchases.

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